Art

MEMORANDUM

30 JANUARY, 1978

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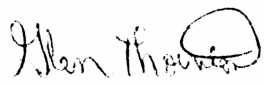          Glen Thornton

SUBJECT:    TMC 1503D ALGORITHM PROBLEM DISPOSITION

The TMC 1503D algorithm checkout was completed and all algorithm
problems discovered during the TMC 1503B algorithm check were
fixed except for the following :

1. Inconsistent overflow and error indications
   in some cases.

2. Overflow conditions for numbers greater than
   1EE99 in some cases.

3. Performing P→R conversion while doing arithmatic
   calculations alters pending operations.

4. Intermixing trendline and arithmatic calculations
   produces wrong answers.

Manual revision will cover the above conditions.

Attached is a detailed disposition list on the TMC 1503B algorithm
checkout.

Glen Thornton, Programmer

Johnny Barrett, ALEX Manager

Pat Lam, Program Manager

| PROBLEM | EXAMPLE | REASON | DISPOSITION 1503 B | 1503 D |
|---|---|---|---|---|
| NEGATIVE ZERO EXPONENT ENTRY WITH MANTISS $\geq 10$ FOLLOWED BY $+, -, x, \div, Y^X, \sqrt{Y}$ OR $=$ WILL RESULT IN EXPONENT OF 99 OR OVERFLOW | 12 EE $-$ 00 $=$ ANSWER IS 12 EE 99 | ? | Manual Revision (Add operational statement) | Algo Corrected |
| OVERFLOW CONDITION FOR ANY CALCULATION HAPPENS AT A DIFFERENT LIMIT DEPENDING UPON NUMBER OF DIGITS AND MAGNITUDE OF NUMBER. ALL FUNCTIONS DO SEEM TO OVERFLOW AT SOME NUMBER GREATER THAN 1EE99. | 1.23456EE99 x2 = OVERFLOW 1.23EE99 x 3 = 3.69EE99 | OVERFLOW ROUTINE | Manual revision (Restate error Conditions) | Manual revision (Re-state error conditions) |
| MEMORY 5 NOT USEABLE DURING PROGRAMMING OF MEMORY ARITHMETIC IS ALSO USED IN THE PROGRAM AND THE PROGRAM IS OVER 16 STEPS LONG. | +1 ☐ STO 5, RCL 5, SUM 5, 2ND PROD 5, R/S WILL CAUSE CONTIN-UOUS LOOPING. IF MEMORY 6 IS USED - OK | MEMORY ARITH-METIC FLAGS STORED IN MEMORY #5 | Manual revision | Algo Corrected |

## TI-55 ALGORITHM CHECKOUT

| PROBLEM | EXAMPLE | REASON | 1503 B | 1503 D |
|---|---|---|---|---|
| NUMBER WITH NON ZERO VALUE IN LAST GUARD DIGIT AND MAGNITUDE $-.5 < x < .5$ WILL NOT BE CALCULATED FOR SINH, TANH OR INVERSES. | $1 \div 3 = 0.3333333$ 2ND, SINH ANSWER IS 0.3333333 | ERROR IN ROUTINE WHICH CHECKS FOR SMALL VALUE APPROXIMATION WHERE SINH X, TANH X AND INVERSES $\rightarrow$ X. | Manual revision (use EE key to truncate guard digits) | Algo corrected |
| MANUAL STATES TRIGS ARE ACCURATE FOR ALL 8 PLACES FOR CALCULATIONS IN $\pm$ 36000 DEGREE RANGE. TANGENT IS ONLY FUNCTION WITH QUALIFYING STATEMENT | SIN 360000 = 2EE-08. ZERO IS CORRECT ANSWER | INACCURACY PICKED UP IN RANGING ROUTINE | Manual revision (Re-state accuracy) | Manual revision (Re-state accuracy) |
| INV SINH ACCURACY IS ONLY 2 PLACES FOR NEGATIVE NUMBERS IN SOME CASES. | -8000 INV SINH = -9.6819453 CORRECT ANSWER IS -9.680344 | PROGRAM ERROR PUTS GARBAGE IN THIRD DIGIT | Manual revision (Take sinh of positive number and then change sign.) | Algo corrected |

DISPOSITION

| PROBLEM | EXAMPLE | REASON | 1503B | 1503D |
|---|---|---|---|---|
| LOGS AND SOME CONVERSIONS ONLY DISPLAY 4 OR 5 DIGITS IN SOME CASES WHEN MORE DIGITS WHEN ARE ACCURATE AND AVAILABLE. | EE = DOESN'T DISPLAY 8 SIG. DIG. X 1000 DOES | NORMALIZING TECHNIQUES | Not actually a problem. (Covered by general accuracy statement in manual.) | Not actually a problem. (Covered by general accuracy statement in manual.) |
| $\Delta\%$ CALCULATIONS WITH RESULTS WHICH ARE INCREMENTALLY CLOSE TO 100 YIELD ERROR CONDITION | 6EE99 2ND % 99.999999EE6= 1.6666667 CORRECT ANSWER IS -100 | RELATED TO ERRORS IN LIMIT AND ERROR CONDITION PROGRAM | Manual revision | Algo corrected |
| $\Delta\%$ CALCULATIONS WITH RESULTS WHICH ARE VERY LARGE RESULT IN ERROR CONDITIONS | 9EE6 2ND $\Delta\%$ 6EE98 YIELDS 1.1111111EE93 FLASH CORRECT ANSWER IS 6.6666667EE93 | RELATED TO ERRORS IN LIMIT AND ERROR CONDITION PROGRAM | Manual revision. | Algo corrected |

Note:
$\Delta\%$ function has been redefined in 1503D as:

$$X_2 \boxed{2ND} \boxed{\Delta\%} \boxed{X_1} \triangleq \frac{X_2 - X_1}{X_1}$$

$$X_1 \boxed{2ND} \boxed{\Delta\%} \boxed{Const} \text{ Defines } X_1 \text{ as } \underline{CONSTANT}$$

Manual revision & stuffer for application book are needed.

| PROBLEM | EXAMPLE | REASON | DISPOSITION 1503B | 1503D |
|---|---|---|---|---|
| Δ% CALCULATIONS WITH LARGE EXPONENTS (EE99) AND RESULTS CLOSE TO 10 CAUSE ERROR CONDITIONS | 1EE99 2ND Δ% 1.1EE99 = 1EE01 FLASH CORRECT ANSWER IS 10 | RELATED TO ERRORS IN LIMIT AND ERROR CONDITION PROGRAM | Manual revision (Re-state accuracy.) | Algo corrected |
| | 1EE99 2ND Δ% 1.1111111 EE99 = 1EE01 FLASH CORRECT ANSWER IS 1.1111111 EE01 | RELATED TO ERRORS IN LIMIT AND ERROR CONDITION PROGRAM | | |
| COSH LIMIT IN MANUAL IS STATED 0 TO 10$^{50}$ | | MANUAL & ALGO ERRORS | Manual revision | Algo corrected. Manual revision. |
| DISPLAY BLANKS AFTER R/S CLR, R/S | 2ND R/S, CLR, 2ND R/S | ALGO ERROR | No action | Algo corrected |

DISPOSITION

| PROBLEM | EXAMPLE | REASON | 1503 B | 1503 D |
|---|---|---|---|---|
| SST KEY EXECUTES PROGRAM TO NEXT RUN STOP AFTER FIRST R/S. SHOULD SINGLE-STEP THROUGH PROGRAM. | 1+2=R/S 3+4=R/S | ALGO ERROR | Already Covered in "Programming notes" in manual. | Algo corrected Manual revision. |
| ERROR INDICATIONS ARE INCONSISTENT, SOMETIMES INACCURATE AND FREQUENTLY CONFUSING. PARTICULARLY TRUE ON TWO VARIABLE FUNCTIONS AND HYPERBOLICS. | .099 Y$^X$ 1.1111111EE99 YIELDS POS. UNDERFLOW .099 Y$^X$ 1.1111112EE99 YIELDS NEG. OVERFLOW  3△% 5EE99 YIELDS 3.3333333 EE99 FLASH 2△% 5EE99 FLASH 1△% 9.9999999 EE99 YIELDS POS. OVERFLOW | RELATES TO OVERFLOW PROGRAM PROBLEM | Manual revision (Re-state error Conditions) | Manual revision (Re-state error Conditions) |

| PROBLEM | EXAMPLE | REASON | DISPOSITION | |
| --- | --- | --- | --- | --- |
| | | | 1503 B | 1503 D |
| | INV. TANH 1 YIELDS 115.12925 FLASH SHOULD BE POSITIVE OVERFLOW | | | |
| R/S TREATS DISPLAY AS NON LIVE ENTRY. SST TREATS IT AS LIVE ENTRY | 6 2ND SST 60 2ND SST 60 | ? | Manual revision (Add Operational statement.) | Algo corrected. (Both R/S & SST treat display as live entry) Manual revision |
| | 10+20=R/S RST ENTER 5 R/S YIELDS 30 IN DISPLAY RST ENTER 5 SST THROUGH PROGRAM YIELDS 530 | ? | | |
| 9.9999999EE-90 OR SMALLER NUMBER WHEN MULTIPLIED BY ZERO LOCKS UP THE CALCULATOR | 1EE -90x0= LOCK UP | ? | No action | Algo corrected |

## T1-8t Algorithm Checkout

| Problem | Example | Reason | Disposition | |
|---|---|---|---|---|
| | | | ISO3B | 1703D |
| Performing P→R conversion while doing arithmatic operation alters the operation. | 2, +, ( 3, X≥Y, 4, 2nd, P→R, 2nd, INV, P→R) = 12 Correct Ans. is 0.75 | | Manual revision (Add operational statement) | Manual revision (Add operation statement) |
| Intermixing trend-line and arithmatic calculations produces erroneous answers. | | | Manual revision (Add operational statement) | Manual revision (Add operation statement) |
| Statistical data registers are affected by pending ops. | DATA ENTRY (1,2,3,4) 2, +, (2, - 2nd, VAR = 1.5 Correct ans. is 2.75. Mean value is fetched instead of variance. | | Manual revision (Add operational statement) | Algo Corrected |

# TI-55 Algorithm Checkout

| Problem | Example | Reason | Disposition | |
|---|---|---|---|---|
| | | | IS03B | IS03D |
| Calculating x', y' in trend-line problems changes The 1st 8 program steps (0→7) | 2ND, LRN. <br> 12, x, 3 = 2ND R/s <br> 2ND, LRN <br> 1, Σ+ <br> 3, Σ+ <br> 10, 2ND, x' <br> 9, 2ND, y' <br> 2ND, RST, 2ND, R/s <br> gives flashing <br> '2.900 000' <br> Right ans. <br> is 36 | | Manual revision? | Program memory is repartitioned such that x' & y' calculations affect last 8 program Steps (25→32) instead. |